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U.S. Department of Transportation
Docket Management System,
Docket FAA-2003-15230
Room Plaza 401
400 Seventh Street, SW.
Washington, DC 20590–0001.

Subject: Comments to Docket **FAA-2003-15230**, "Call for Information on Supersonic Aircraft Noise"

Reference: Request for information and notice of workshop, published in the Federal Register on May 23, 2003 (68 FR 28181)

Dear Sirs:

The Boeing Company is pleased to respond to the Federal Aviation Administration's call for information on supersonic aircraft noise. There have been sufficient advances in the understanding of sonic boom, the prediction of sonic boom characteristics, and the knowledge required to design a small supersonic aircraft with reduced boom signatures to warrant beginning development of a noise standard for supersonic flight over land.

We appreciate the opportunity to submit our enclosed comments relative to these issues, and look forward to participating in the planned workshop.

Please direct any comments or questions to Mr. Bill Glover, Director, Environmental Performance Strategy, at (425) 266-3173.

Sincerely,

Daniel P. Mooney

Enclosure

Boeing Commercial Airplanes
Comments to Docket FAA-2003-15230,
"Call for Information on Supersonic Aircraft Noise"
Draft Response to Federal Register Call for info on Supersonic Aircraft

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General Information.

There are four pillars of technologies and processes on which the future success of all commercially viable supersonic aircraft will depend:

1. Propulsion system technology;
2. Advanced materials, systems, and structural design and analysis;
3. Aerodynamic design and analysis; and
4. Advanced multidisciplinary design and optimization.

Advances have been made in all of these areas since 1999. In particular, applications rooted in NASA's High Speed Research/High Speed Civil Transport (HSR/HSCT) program have been explored for alternative classes of aircraft of different speeds and sizes.

Development of sonic boom acceptability criteria is now a fundamental prerequisite for any commercially viable supersonic product to proceed. Developing the criteria will require significant additional work. Determining the acceptable sonic boom waveform(s) at ground levels will require psychoacoustic, physiological, and fixed ground structure response acceptability testing.

NASA's HSR/HSCT program significantly advanced our knowledge of reactions to sonic booms created by current supersonic aircraft and established appropriate metrics. Human reaction correlated better to people's attitudes towards the source of the boom than on the physical characteristic of the boom.

Human subject testing in acoustic chambers needs to proceed in order to determine reaction to low booms of various shapes in the presence of other sounds in order to establish baseline values. Of equal importance is the study of public opinion on the future success of overland supersonic flight.

Sonic Boom Acceptability Criteria

Any sonic boom acceptability criteria that is established on the basis of human, animal, and structural testing and surveying must be endorsed by an international body, such as ICAO, in order to encourage all countries and their regulatory agencies to adopt the same set of criteria, and eventually the same overflight rules. The current regulatory prohibition against civil aircraft flying supersonically must be revised in light of the emerging possibility that supersonic flight could generate acceptable sonic booms over inhabited areas through a combination of advanced aircraft design and operational constraints.

Preliminary feasibility studies conducted over the last three years, and most recently on the F-5 Shaped Sonic Boom Demonstration (SSBD) sponsored by the Defense Advanced Research Projects Agency (DARPA) and the National Aeronautics and Space Agency (NASA), have indicated that low sonic boom designs are technically feasible at some penalty in airplane performance, economics, and usability.

Regulatory criteria for overland operation are an important element that will significantly affect airplane design and operation. Since supersonic aircraft are much more sensitive than subsonic aircraft to design requirements, regulatory criteria need to be considered as soon as possible to assess their impact on airplane design, development, and operation.

Design Challenges

Airplane design for low sonic boom requires detailed design of the airplane to achieve an acceptable "shaped" sonic boom waveform at the ground plane after propagation during maneuvers (focused boom) and from climb/cruise altitudes. Generally, low boom design requires long aircraft length and intricate integration of wing, body, nacelles, and empennage.

Long range supersonic cruise aircraft will need to be extremely efficient, not only for meeting operating cost, range, community noise and total emissions goals, but also for minimizing the weight-related component of the sonic boom. The required level of efficiency will demand the use of:

- lightweight composites and advanced metal structures,
- very efficient propulsion systems that are also environmentally compliant, and
- a high degree of aerodynamic refinement to maximize the cruise lift to drag ratio.

These requirements may well require additional regulatory processes.

Development of software codes is also required to predict sonic boom effects. The established prediction of propagation of booms through stratified atmospheres from steady level flight must be supplemented by codes accounting for surface reflection in deep valleys and urban canyons, which scatter and focus. We must make sure that tools for prediction of focus booms from maneuvers are robust and can be used routinely by operators of supersonic aircraft to minimize focus booms over inhabited areas.

Integration in Current Infrastructure.

The supersonic airplanes must also integrate seamlessly into the present commercial and general aviation infrastructure that currently accommodates global business jets. While there will be some differences in airplane performance characteristics from current subsonic business jets, it is important to the potential customer base that the airplane require little or no special handling, either on the ground (airport infrastructure) or in the air (air traffic control). In addition, it is highly desirable that a future supersonic airplane also have comparable community noise levels with subsonic aircraft. This is a significant challenge and may require the development of unique community noise standards for supersonic airplanes.